

EFFECTS OF HAND-OVER-HAND PHYSICAL GUIDANCE AND TRACING ON PREWRITING SKILLS OF PRESCHOOL-AGED CHILDREN

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ABSTRACT

The purpose of this study was to increase the formation of the pre-handwriting skill of imitating lines and circles with two 2-year-old preschool students using a hand-over-hand prompting procedure. Both students attended a preschool special education classroom in a rural school district. During baseline, line and circle imitation for both students were scribbles on the page within no specific symbols or letters. When hand-over-hand and tracing prompts were implemented, an increase circles and lines was found. For a second intervention, participant 1 was provided with a thick pencil for an additional intervention while participant 2 was given a specific drawing space. After these interventions, pre-handwriting skills further improved for both participants. The benefits of employing these interventions, within a single subject research design, are discussed.

Keywords: Pre-School Students with Disabilities, Pre-Handwriting Skills, Tracing, Hand Over Hand Physical Prompts, Using an Over Sized Pencil, Specific Drawing Space, Single Case Designs.

INTRODUCTION

A delay in handwriting skills can be detrimental in the early years of education if handwriting preskills are not directly taught (Amundson, 2005; Berninger, Vaughn, Abbott, Abbott, Rogan, Brooks, Reed, & Graham, 1997). Typical developing children holding a crayon with the thumb and forefinger and imitate vertical strokes between the age 18-24 months (Howard, Williams, & Lepper, 2010). Within the 24 to 36 month range, children should be able to hold a pencil with the thumb and forefinger and imitate horizontal lines, crosses, and circles. These skills are building block skills for beginning handwriting and other written communication skills (Berninger et al., 1997).

There are several ways to increase handwriting skills in students. Behavioral research in handwriting include the use of positive consequences such as free time for increased speed and legibility (Hopkins, Schutte, & Garton, 1971), error correction (positive practice) or the lowering of daily grades (response cost) (McLaughlin, Mabee, Byram, & Reiter, 1987), and the use of tracing and prompt procedures (Onsoe, 1988; Park,

McLaughlin, & Weber, 2007; Sim & Weisberg, 2001), and explicit drill and practice interventions (Graham, 1999; Park et al., 2007).

In addition, there is a growing database on the use of the methodology advocated in occupational therapy to improve handwriting (Feder, Majnemer, & Synnes, 2000). These have included the use of visual motor drills and additional handwriting practice. For example, Case-Smith (2002) employed between group comparison between direct occupational therapy with an emphasis of using visual-motor skills and handwriting practice and no intervention. Students in the intervention group showed increases for handwriting legibility while the students in the comparison group did not change. Another study by Denton Cope, and Moser (2006) reported that sensory motor practice actually decreased the handwriting performance of elementary students ages 6 to 10 years with dysgraphia. However, they found moderate gains on the Test of Handwriting with their therapeutic practice group.

When intervening with emergent handwriting skills in very

young preschoolers, it was hypothesized that these interventions should be successful. The purpose of this study was to examine the effectiveness of a tracing and hand-over-hand prompting for two prewriting skills of copying lines, or writing circles, by two young preschool students. Another purpose was to employ a single case research design (Barlow, Nock, & Hersen, 2008; Kazdin, 2011) to evaluate the changes in student handwriting performance over time. Since there has been very little research with pre-handwriting employing young children, the final purpose was to add to this literature on the use of explicit instruction and hand-over-hand guidance. In this way, one could begin to establish the research for developing evidence-based practice with educational psychology (Kratochwill & Shernoff, 2004) for teaching handwriting in the schools.

Method

Participants

Participants in the study were two children enrolled in a birth to six years special education preschool program. Participant 1 was 2 years 7 months old at the time of original assessment. She was previously diagnosed with gross motor, social/emotional, and language delays. Participant 2 was a 2 year 5 month old at the time of original assessment. He was previously diagnosed with social/emotional delays. Both children were receiving services on Individual Family Service Plans (IFSP) through their local school district. Both were attending the morning session of the preschool program.

Setting

Assessment, baseline, and intervention were all conducted in one of two the preschool classrooms. The original group of 18 students was split in half and the two groups of preschool children which rotate sides every other day. Thus our two participants were in both classrooms twice a week. The classrooms were staffed with one certified teacher, three paraprofessionals, one physical therapist, one physical therapy aide, and approximately 45 high school volunteers working in the classroom at various times throughout the day. In addition, the Speech and Language Pathologist (SLP) and

Occupational Therapist (OT) were also present at various times each week.

Sessions were conducted during the daily "Work Time" session. At this time, the preschool children typically engaged in free play activities at the start of school. Each participant was taught at a back table of the classroom. Only, the participant and the researcher were present at the table. All sessions were conducted in the same classroom.

Dependent Variables

The dependent variable for each participant was the total number of handwriting points earned each session. During each session, the participant was instructed to draw a total of five lines or circles. The participants could receive up to three points per letter, for a total of 15 points. For lines, points were awarded for formation (1), slant (1), and area (1). Formation was defined as being judged as a line. Slant was defined as the line being vertical with no left or right slant. Area was defined as the figure being drawn within $\frac{1}{2}$ inch from the model line or on top of the traceable line. Circles were judged on formation, size, and area. Formation and area had the same definition for both lines and circles. Size was defined as being within $\frac{1}{8}$ th of an inch of the model size or the same size as the model circle.

Experimental Design and Conditions

A multiple baseline design with two reversals (ABCBA) for participant 1 (Barlow et al., 2008; Kazdin, 2010) was used to determine the effectiveness of verbal and physical prompts and tracing procedures. We employed an ABCA design for our second participant.

Baseline

Each participant was given a piece of white, blank paper, folded into thirds. The investigator then modeled the behavior (either drawing a line or drawing a circle) using a verbal prompt. First, the participant was then given a pencil and told "Your turn," followed by the respective instructions. For line, the prompt was: "My turn. Start at the top. All the way down." For circles, the prompt was: "My turn. Start at the top. One time around." The prompts were repeated five times for each behavior. Baseline for drawing lines was conducted for 2 sessions for Participant

1 and four sessions for Participant 2. Baseline for drawing circles was conducted for four sessions for Participant 1 and 6 sessions for Participant 2. A return to baseline took place for last two sessions.

Hand-Over-Hand

During the first intervention, hand-over-hand assistance, the participant was given a white piece of paper folded into thirds with either five vertical lines or 5 circles, drawn using a marker on the one third section of the paper. The experimenter placed her hand over the participant's hand to assist with proper pincer grip and guided the participant's hand over each figure. At the same time, the experimenter gave the same instructions as in baseline. Minimal guidance was provided. This was repeated five times for each line or circle during each session.

Hand-Over-Hand with Drawing Space for Participant 1

The same procedures as with the hand-over-hand intervention were used the first intervention with a visual prompt for drawing space was added. A black piece of cardstock, one third the size of an 8 1/2 x 11 inch piece of copy paper with a 1/2 wide and 2 1/2 inch tall space cut out was placed on top of the paper. This cardstock was then moved to display the target line to trace for all five lines on each session. For the circle drawing behavior, the cut out was a 1 inch x 1 inch square.

Hand-Over Hand with an Oversized OT Pencil for Participant 2

A visual prompt for drawing space was not used, but a thick pencil was provided by the school district's OT. The pencil provided assistance with pencil grip for this child. This was carried out to assist the student in developing the appropriate manner of holding a pencil. The OT pencil was used in conjunction with the hand-over-hand procedure.

Hand-Over-Hand

After the second intervention (C), the initial hand-over-hand intervention was implemented for each participant. This was carried out to determine if either of the second interventions was effective.

Reliability

Reliability checks were conducted on each session for

each behavior throughout the study. After being trained on the scoring of each figure on formation, area, and size or slant by the first author, another university student conducted these checks independently. The number of agreements was divided by the number of agreements and disagreements and multiplied by 100. An agreement was scored if both observers scored the item the same. Any deviation was scored as a disagreement. Reliability was conducted for 100% of sessions with a total reliability score of 100%.

Results

As shown in the top panels of Figure 1, during baseline for line drawing, Participant 1 scored 0 points across all four sessions. When the hand-over-hand intervention was implemented, her performance increased. (M = 10.1 points; range 9 to 14) she ranged from 9 to 14 points over nine. When the OT pencil was added her problem behaviors declined. In addition her points per session declined slightly (M = 9.5; range 6 to 13 points). When baseline was again in effect, the number of points earned declined (M = 2.5; range 2 to 3). All points participant 1 earned during the second baseline were earned for writing within the correct area.

For circles, Participant 1 had a total of 0 points for baseline. During the hand-over-hand intervention, her performance improved (M = 11.25; range 8 to 15 points). The same behaviors inappropriate behaviors were observed emerged during circle drawing occurred. Therefore, a hand-over-hand with OT pencil condition was implemented. The number of points earned ranged 6 to 9 points with a mean of 8.0 points. This phase was in effect for only three sessions.

When baseline was again in effect, this participant's performance decreased (M = 2.5; range 2 to 3). All the points earned during the second baseline were earned for writing within the correct area.

As seen in Figure 2, Participant 2 earned no points over two sessions of baseline for line drawing. When the hand-over-hand condition was employed, his performance increased in line drawing (M = 9.0; range 6 to 12). During the hand-over-hand with drawing space phase, his

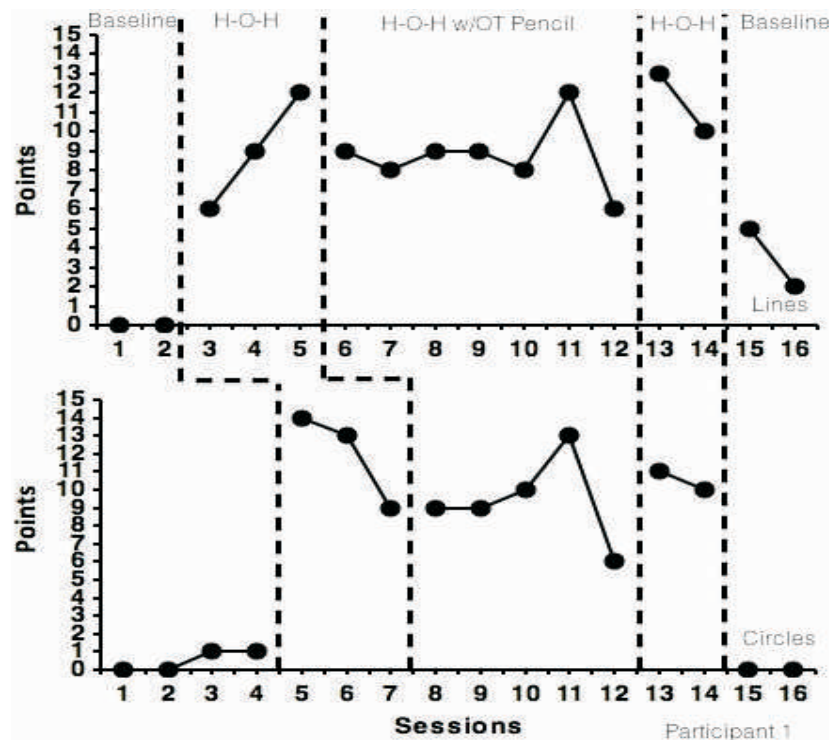


Figure 1. The Total Number of Points Earned for Each Session Over Each Behavior and Condition for Participant 1

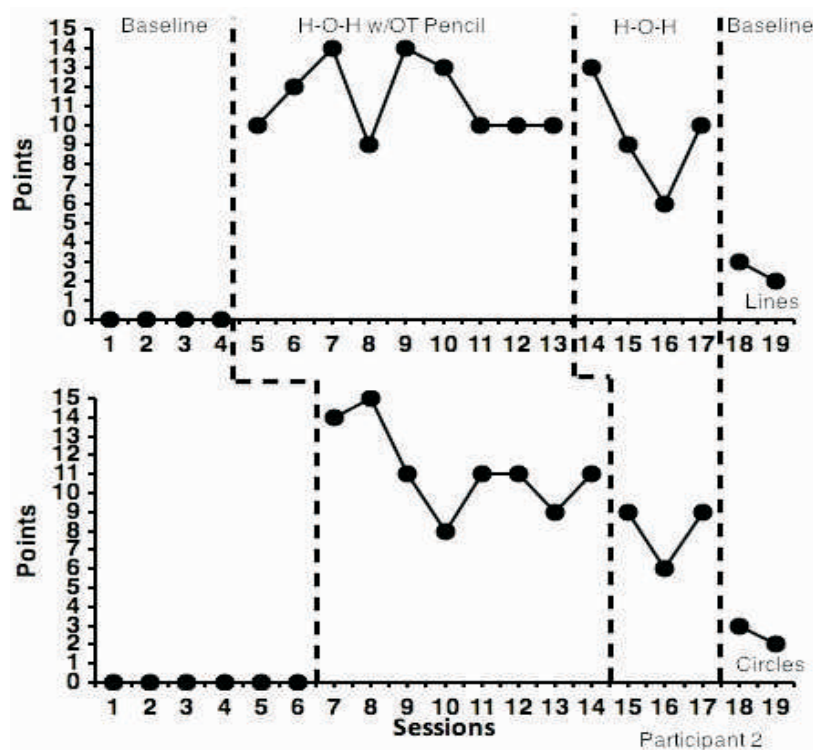


Figure 2. The Total Number of Points Earned for Each Session Over Each Behavior and Condition for Participant 2

performance remained high ($M = 8.7$; range 6 to 12). When hand over hand was again in place, his scores remained high ($M = 11.5$; range 10 to 13). His

performance decreased during the return to baseline ($M = 3.5$; range 2 to 5). Points were earned for both formation and area during the second baseline for lines.

For drawing circles, Participant 2 earned only 1 points in baseline ($M = .33$; range 0 to 1). When the hand over hand procedure was employed his performance increased ($M = 12$; range 9 to 14). When the hand-over-hand with drawing space intervention was employed drawing circles his performance was lower ($M = 9.6$; range 7 to 13). When hand over hand was reintroduced, his performance increased slightly ($M = 10.5$; range 10 to 11). When baseline conditions were again in effect, his performance decreased to 0.0.

Discussion

Overall, both participants in the study showed an increase in writing in the correct area, having appropriate formation, and having less slant with the implementation of hand-over-hand assistance for drawing lines. By the end of the hand-over-hand intervention, neither participant required minimal physical assistance, with the participants guiding the movement and the researcher provided additional control. The same was true for both participants on the circle drawing task. The majority of physical assistance required was for ending the circle. Both participants tended to continue the circle pattern several times before lifting his or her pencil. Developmentally, this is appropriate since circle drawing comes much later than line drawing (Case-Smith, 2000).

For the second intervention, Participant 1 was given a thicker pencil to aid with grip. This appeared to make the writing task more comfortable for the participant and minimized problem behaviors that arose shortly into the first intervention. Participant 2 received a specific drawing space for the second intervention. This was done to aid with visual attention. The intervention appeared to be effective, as the participant independently placed the pencil within the given drawing area, but still required assistance with the drawing motion.

When intervention was removed, Participant 1 returned to scores 2 or 3 points for each line or circle drawn. This was an increase from the original baseline, which she received no points. Points earned in this baseline phase were earned for starting the Figures in the correct drawing area. Thus, she was unable to perform correct

formation, slant, and/or size. Participant 2 earned points for correct formation and area in the reversal for line drawing, but earned no points during the second baseline for circles. This increase in points for both line and circle drawing in both participants suggests that the interventions were effective in increasing the targeted fine motor skills.

It was recommended that Participant 1 continue with hand-over-hand assistance with the OT pencil. Increased teacher directed practice in formal academic settings as well as free play drawing and coloring activities were also recommended. For Participant 2, it was recommended that hand-over-hand assistance be continued with minimal guidance. It was also recommended that he receive extra practice in teacher directed activities. We also believe that it would be beneficial for practice to occur in a setting with less activity and people present, as he appeared to be easily distracted.

The present outcomes provide a replication of employing a special pencil to assist children with developmental delays. The research also provides some documentation that employing an oversized pencil was an evidence-based practice that is being advocated by many occupational therapists and their respective training institutions (Craik & Rappolt, 2003; Taylor, 2000). For participant 2, the use of teacher directed practice with consequences partially supports our work in handwriting (McLaughlin, 1981; McLaughlin et al., 1987; Park et al., 2007). However, in the present analysis, younger children served as our participants. The use of a single case replication design (Barlow et al., 2008; Kazdin, 1982) permitted two different ways to assist preschool students with the pre handwriting skills to be evaluated and assessed. Clearly, the use of single case methodology can provide both special education teachers and occupational therapists ways to develop evidence-based practice in the schools. With the increasing emphasis in evidence-based practice with school interventions (Kratchowill & Shernoff, 2004), the outcomes and procedures from the present investigation should be of interest to a wide range of school-based professionals.

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